EXTENDED VERSION
Notice of Intent to Release a Solicitation
for NASA Lunar Reconnaissance Orbiter Investigations
March 2004

The National Aeronautics and Space Administration (NASA) intends to release an Announcement of Opportunity (AO) for Lunar Reconnaissance Orbiter Measurement Investigations in May 2004. These investigations will respond to the overall LRO mission objectives to obtain those measurements necessary and sufficient to characterize future robotic and human lunar landing sites and to identify potential resources, with emphasis on applied science/engineering assessments. The LRO mission will require a variety of instruments to be carried on a spacecraft to be launched in the fall 2008, with a prime mission phase in lunar orbit of at least one Earth year. The launch services and spacecraft will be NASA-provided resources. Proposals in response to this AO will be due 90 days after its formal release.

In January 2004 the President advanced the scientific, security, and economic interests of the United States through the announcement of a robust space exploration program that integrates human and robotic exploration activities. This decision was documented by *President's Space Exploration Policy Directive* (NPSD31)*(Goal and Objectives)* and *A Renewed Spirit of Discovery – The President's Vision for U.S. Space Exploration* (January 2004). Subsequent to this announcement, NASA established an external analysis group entitled the LRO Objectives/Requirements Definition Team (ORDT) that met in March to assist NASA in the definition of mission goals and objectives (Note: see http://centauri.larc.nasa.gov/lro/library.htm for the President's directive and the full ORDT preliminary report).

From the results of this external requirements definition group, NASA has established the following priority ordered objectives for the initial robotic elements in the Lunar Exploration Program:

- Characterization of the lunar radiation environment, biological impacts, and potential mitigation by determining the global radiation environment, investigating shielding capabilities, and validating other deep space radiation prototype hardware and software.
- Determine a high resolution global, geodetic grid of the Moon (in 3-dimensions) that provides the topography necessary and sufficient to identify future landing sites;
- Assess in detail the resources and environments of the Moon's polar cap regions; and
- Determine with high spatial resolution the elemental composition, mineralogy, and other regolith characteristics of the Moon's surface.

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Of these four inter-related objectives, the first three are given highest priority. It is anticipated that individual measurement systems, rather than suites of instruments, will be best suited to accomplish the mission objectives. Therefore, this AO is expected to solicit measurement investigations for the LRO mission from the seven highest priority measurement sets as follows:

- Characterization of the deep space radiation environment in lunar orbit;
- Geodetic global topography;
- High spatial resolution hydrogen mapping;
- Temperature mapping in polar shadowed regions;
- Imaging of the lunar surface in permanently shadowed regions;
- Assessment of meter and smaller scale features for potential landing sites;
- Characterization of the changing lunar surface illumination conditions in polar regions at time scales as short as hours

Participation in this AO will be open to all categories of U.S. and non-U.S. organizations, including educational institutions, industry, not-for-profit organizations, Federally Funded Research and Development Centers, NASA Centers and other Government agencies. Investigators are responsible for and may assemble their measurement investigation teams (Co-Investigators) from any and all of these organizations. Investigators are responsible for the complete investigation including the experiment hardware, software, operations planning, data analysis, archiving, development of higher-level data products that facilitate applied science and engineering-driven assessments of the Moon, and (as appropriate) publication of results. Since competitive Guest Investigators and Lunar Data Analysis Programs will be separately solicited at a later time), all Co-Investigators named to an investigation for this LRO AO must have a substantial well-defined role associated with the development and delivery of the proposed measurement sets. As such, proposers should avoid including large numbers of Co-Investigators whose only roles would be for data analysis and scientific interpretation.

The total budget for all investigations selected with this AO is expected to be less than $120M (Real Year Dollars) including design, development, test, launch, and mission support and data analysis, including all reserves. Given the limited funding available for this mission, each proposed investigation must explicitly identify adequate reserves to ensure that all phases of the investigation (design, development, integration, test, launch, and mission operations and data analysis) can be successfully completed without additional funding.

This mission will be launched on a Delta II launch vehicle, which should allow accommodation of a total instrument payload of less than 120 kg with a total power requirement of less than120 watts; however, note that these are preliminary estimates to be refined as the spacecraft design matures.

Given the submission of proposals of merit, NASA intends to select as many investigations as resources permit. Investigations selected will be funded to begin immediate design activities. Investigations that successfully complete these activities,

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including a Preliminary Design Review/Confirmation Review, may then be confirmed and funded for detailed design and development leading to flight. Should resource limitations present a problem, NASA reserves the right to cancel an investigation(s) at any time even if it (they) have successfully completed all prior activities.

The LRO AO may contain provisions that differ from this preliminary notice, in which case the provisions in the AO will take precedence. At the release of the AO, supporting material to aid prospective proposers will be available in the Proposal Information Package (PIP) and other documents in the LRO Library at the Lunar Reconnaissance Orbiter Acquisition Program website given above.

Questions or comments about this intention to release an LRO Investigations AO may be addressed in writing or by E-mail to the NASA Lead Scientist for Moon and Mars:

Dr. James B. Garvin
Ref.: LRO
Solar System Exploration Division
Code SE
Office of Space Science
National Aeronautics and Space Administration,
Washington, DC 20546-0001
E-mail: james.b.garvin@nasa.gov (subject line to read "LRO AO").

Responses to all inquiries will be answered by E-mail and also posted weekly at the Frequently Asked Questions (FAQ) location of the LRO Acquisition Program website noted above; anonymity of persons/institutions who submit questions will be preserved.

Additional characteristics of this intended AO are expected to be:

- The LRO launch readiness is targeted for October 15, 2008.
- The LRO baseline mission is nominally 1 Earth year at 30-50 km circular, polar orbit. After instrument selection consideration will be given to reducing the mission duration in the nominal orbit in order to enable a short duration at a lower altitude or, alternatively, an extended mission in a higher elliptical orbit.
- The LRO spacecraft will be a 3-axis stabilized platform with both stored data and real-time downlink capabilities. The current estimate for the downlink data rate is 10 Mbps. The downlink duty cycle, on-board data storage capacity, and refinement of the achievable data rate are all under study and will be more fully defined in the AO.
- Responsibility for the LRO mission project implementation is assigned to the NASA Goddard Space Flight Center (GSFC). It is the GSFC LRO Project's responsibility to provide the launch system, spacecraft, including communication and data systems, and payload accommodations, as well as mission systems engineering, assurance, and management.

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• The Principal Investigator (PI) for each selected measurement investigation will be responsible for all aspects of his/her investigation including instrument design, development, test, and delivery to GSFC per the LRO project schedules.

• The funding profile for the LRO measurement investigations has not yet been determined, but will be defined in the AO.

• Selected proposers may expect to be placed under letter contract within two weeks of selection and should propose a business plan accordingly.

• Proposals submitted in response to this intended AO will be evaluated by peer reviews principally on the basis of their applied scientific and technical merit of the proposed investigations. In addition, technical, management and cost risk will also be evaluated by peer review to determine the investigations' feasibility for implementation.

• Investigations that plan to fly small quantities of radioactive material for heating, calibration, or other reasons must clearly define such intentions in their proposals.

• For U.S. PI-led investigations; the sum of contributions of cash or non-cash (property and services) to LRO investigations by non-OSS domestic or foreign organizations may not exceed one-third of the proposed total development cost of the investigation (in all cases, contributions must be identified by source and amount in the proposal).

• Complete investigations and/or team member participation proposed by non-U.S. organizations are welcomed on a no-exchange-of-funds basis to NASA and will be evaluated in the same way as all other proposals for science merit, relevance, feasibility, and risk (note that all proposals involving non-U.S. participants must include a signed letter(s) of endorsement from the institution(s) responsible for approving and funding the proposed activity(ies) that will be due at the same time as the proposals; proposals lacking such letters, or letters judged inadequate by NASA, may be cause for rejection of the proposal without further review).

• All data from LRO investigations will be nonproprietary and must be made available to the science community and public through NASA's Planetary Data System as soon as possible following calibration and validation, but no later than six months from receipt (note: higher order engineering-related data products are likely to be required as directed by the NASA Office of Exploration Systems).

• All U.S.-led proposals must include a firm commitment to NASA's objectives for Education and Public Outreach and for inclusion of small disadvantage businesses.

• A Project Science Measurements Group (PSMG) that will be chaired by the LRO Program Scientist from NASA Headquarters will be formed soon after selection. Each selected PI will be a member of this group, which will meet regularly throughout the lifetime of the LRO 2008 mission at NASA GSFC to optimize the applied science/engineering return of the mission.

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The following schedule describes the anticipated major milestones of this intended LRO Investigations AO:

AO release	May 2004
Pre-proposal Conference	AO Release + 2 wks
Notice of Intent to Propose due	AO Release + 4 wks
Proposals due by 4:30 p.m. EDT	AO Release + 90 d
Non-U.S. Letters of Endorsement due	Proposal Due Date
Selections announced (Target)	Proposals Due + 4-5 mos
Letter contract award	Selection + 2 wks
Confirmation of investigation(s) for detailed design/development	Selection + 10 months
Delivery of payload hardware	Fall 2007
Launch readiness	October 2008

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